of about 230 microns, with between 31 to 62 weight percent of the particles having a size less than 45 microns, said resin having a carbon yield of at least 50 percent, said finished plate having been graphitized to at least 2100°C and having an initial threshold corrosion potential at 400°F of at least 1,000 millivolts, a maximum initial thru-plane electrical resistivity of 0.011 ohm-cm, an initial flexural strength at 400°F of at least 4000 psi and an electrolyte take up no greater than 5.0 percent" (claim 1).

Regarding the carbonizable thermosetting phenolic resin, Emanuelson et a.l describe "a preferred phenolic resin is one which is either a phenyl-aldehyde resol or a phenyl-aldehyde novolac as shown in U.S. Pat. No. 3,109,712. <u>These preferred resins may be prepared by the condensation of a variety of phenyls and aldehydes</u>" (column 6, lines 62-66). Further, regarding the resin contents, "Laboratory test data on plate sections heat treated to 2100°C (the lowest acceptable graphitizing temperature) and having resin contents of 40 or 50 percent, demonstrate significantly improved properties when compared to plates made with 20 or 30 percent resin. For example, flexural strength with 50 percent resin is approximately twice that with 20 percent resin. Hydrogen permeability and ETU for plates made with 20 or 30 percent resin can be expected to have about three times the hydrogen permeability and ETU of plates made with 40 or 50 percent resin" (column 6, lines 46-57). Furthermore, "To fabricate a separator plate a well blended mixture of the appropriate resin and graphite powder, as described above, is distributed in a mold. This molding compound is compacted under pressure and temperature to melt and partially cure the resin and produce material flow such that the desired thickness and the desired density of 97-99 percent of the maximum theoretical density for the particular graphite/resin mixture used has been attained" (column 9, lines 15-23).

In the Example, a thick separator plate made from a mixture of graphite powder and phenolic resin was compression molded at 149°C, and then the plate was carbonized at about 600 to 1000°C and graphitized at 800 to 2800°C.

Regarding advantages of Emanuelson et al, there is described "separator plates for these cells .... meet high standards in terms of many different characteristics or properties such as: (1)

hydrogen permeability; (2) corrosion resistance; (3) electrical resistivity; (4) thermal conductivity; (5) strength; and (6) electrolyte absorption resistivity" (column 4, lines 36-41).

However, the references fails to disclose or suggest the specific radical-polymerizable thermosetting resin composition kneaded with the pressure kneader under the specific pressure according to the claimed invention.

Concretely, Emanuelson et al. fail to disclose not only pressurized kneading requirement of the claims but also the requirement for a radical-polymerizable thermosetting resin.

Incidentally, the Examiner has mentioned that Emanuelson et al. teach a resin composition which consists essentially of an electroconductive agent and a radical-polymerizable thermosetting resin system. However, although Emanuelson et al. disclose a carbonizable thermosetting phenolic resin, Emanuelson et al. never describes a radical-polymerizable thermosetting resin.

Submitted herewith is a copy of CHEMICAL PROCESS INDUSTRIES, R. NORRIS SHREEVE, McGRAW-HILL BOOK COMPANY, pages 662-673, 3rd Ed., for clarifying the differences between the radical-polymerizable thermosetting resin of the present invention, and the condensation-polymerizable thermosetting resin of Emanuelson et al.

Firstly, the thermosetting phenolic resin of Emanuelson et al. is cured by condensing a phenol (C_6H_5OH) and a formaldehyde (CH_2O), as apparent from the literature (see the chemical formula of page 662). Further, since the condensing reaction is a dehydration reaction, the water (reaction water) is generated with condensation (see the chemical formula and page 663, lines 18-19). That is, since the phenolic resin is cured by the self-condensation of $-CH_2OR$ (methyrol group or alkoxymethyl group) with generating ROH (R: H or an alkyl group), the phenolic resin never has any radically polymerizable unsaturated bond.

On the other hand, the radical-polymerizable thermosetting resin of the present invention is radical-polymerized by the reaction of an unsaturated bond such as a vinyl group ($-CH=CH_2$). For example, vinyl resins are exemplified as a typical radical-polymerizable resin. As is apparent from the attachment (see the chemical formula of page 669), vinyl resins are cured by radical-polymerizing of the vinyl group, and thus the eliminating component such as water (H_20) is not generated in the radical-polymerization. Namely, the unsaturated bond of the

radical-polymerizable resin is attacked by a radical of catalyst (radical initiator) such as acetyl peroxide to initiate the polymerization, and thus the radical-polymerizable resin is polymerized or cured by a radical initiator without generating any components.

Since the phenolic resin is not cured by radical-polymerizing, the radical polymerizable resin differs from the phenolic resin in a curing mechanism as well as chemical or physical properties. Accordingly, the condensation-polymerizable thermosetting resin such as the phenolic resin is not classified into the radical-polymerizable thermosetting resin, and thus the resin of the present invention is different from that of Emanuelson et al.

In view of the foregoing, it is clear that the cited reference fails to anticipate the rejected claim since the cited reference fails to disclose the foregoing material elements of the rejected claims.

Accordingly, reconsideration and withdrawal of this ground of rejection is solicited.

Claims 1-8 and 10-18 are further rejected under 35 USC 102 as anticipated by U.S. 6,251,308 to Butler. This ground of rejection is also respectfully traversed.

Butler discloses "A composition comprising

a) an unsaturated prepolymer resin which comprises one or more of unsaturated polyester and vinyl ester resin;

b) an unsaturated material copolymerizable with said resin and including a terminal ethylene group;

c) at least 50% by total weight of the composition comprising an conductive filler;

d) an initiator to initiate said copolymerization; and

e) an effective amount of a rheological modifier to prevent phase separation between said resin and said conductive filler during molding, said rheological modifier being one or more compositions selected from the group consisting of Group II oxides and hydroxides, carbodiamides, aziridines, polyisocyanates, polytetrafluorethylene, perfluoropolyether, polyethylene and fumed silica, and clays" (claim 1).

Regarding conductive fillers, Butler describes "A preferred filler is graphite particles" (column 4, lines 41-42). "Desirably conductive fillers are at least about 50, about 60, or about 65

weight percent of the molding composition. More desirably the filler is more than about 70 or 71 percent to about 78 weight percent of the molding composition" (column 4, lines 56-60). Further, with regard to an unsaturated prepolymer, "vinyl ester resins are the reaction product of an epoxy terminated oligomer, for example, an epoxy functionalized bisphenol A with an acrylic acid, or methacrylic acid forming acrylic terminal groups on the oligomer" (column 4, lines 18-21). Regarding the copolymerizable unsaturated monomer, "this component is capable of dissolving the resin component at room temperature. ... Examples of suitable monomers are styrene ... The ratio of monomer(s) to resin is desirably from about 40:60 to about 75:25 and preferably from about 40:60 to about 65:35 by weight" (column 4, lines 27-37). Regarding a low-profile agent, "Other optional components to a molding composition include ... low shrinkage additives like polyvinyl acetate or polyethylene" (column 6, lines 38-41).

Furthermore, "The molding compositions may be formulated and mixed using a variety of mixing conditions including either continuous or batch and using a variety of known mixing equipment" (column 6, lines 61-64).

Regarding advantages of Butler, there is described "Molded products made from the compositions of the present invention are useful for a variety of applications demanding complex configurations, conductivity, as well as strength, and corrosion resistance. One particularly advantageous product which can be made by compression molding is a bipolar plate for use in fuel cells" (column 7, lines 19-23).

However, Butler fails to disclose the requirement for pressurized kneading according to the claimed invention.

Moreover, there is submitted herewith a Rule 132 Declaration for clarifying the differences between the present composition and the composition of Butler. As apparent from the Declaration, although the Butler's kneaded composition (Sample C of the Declaration) is a coarse particulate, the present kneaded composition (Sample B of the Declaration) is clay-like or viscous. Further, though the molded plate formed from the present composition is wholly homogenous, the molded plate formed from the Butler's composition is not homogenous. Please note that the composition of Sample A in the Declaration is the same as that of Sample B except

for conventional kneading, and the result of Sample A is approximately the same as that of Sample C. As these results, it is apparent the fact that physical properties of the composition are changed by pressurized kneading. That is, the present composition obtained by pressurized kneading is clearly different from the Butler's composition.

Therefore, it is respectfully submitted that the subject matter of claims is novel in the light of the references. Further, since the references fail to teach kneading with the pressure kneader, the combination of all elements of the subject matter of the present invention would never be predicted from the references.

The present invention provides unexpected advantages. Since the resin compositions of the references are kneaded by a conventional kneader, as apparent from the Declaration, it takes about 1 hour to make the composition a coarse particulate. Further, the central region of the molded plate formed from the composition is blackish, and the corner part is matte and grayish. Therefore, various properties (such as bending strength, thermal conductivity, shrinkage rate and warp) of the mold article would never be improved.

On the other hand, according to the present invention, since the resin composition is kneaded by a pressure kneader, it takes about 3 minutes to make the composition clay-like or viscous. Further, since the molded plate formed from the kneaded composition is wholly homogenous, the various properties of the mold article can be improved. Further, as apparent from Table 2 of the present specification properties such as bending strength, thermal conductivity, shrinkage rate and warp of the present mold article (Example 6 of the specification) are improved.

Such advantages of the present invention would never be predicted from the references.

Accordingly, this ground of rejection is also deemed to be untenable and reconsideration is respectfully solicited.

In view of the foregoing, it is believed that the application is now in condition for allowance, and such allowance is solicited.

Respectfully submitted,

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